

Effects of Radiation and a High Iron Load on Bone Mineral Density  
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Astronauts on long duration space flight missions to the moon or mars are exposed to radiation and have increase iron (Fe) stores, both of which can independently induce oxidative stress and may exacerbate bone mass loss and strength. We hypothesize a high Fe diet and a fractionated gamma radiation exposure would increase oxidative stress and lower bone mass. Three mo-old, SD rats (n=32) were randomized to receive an adequate Fe diet (45 mg Fe/kg diet) or a high Fe diet (650 mg Fe/kg diet) for 4 wks and either a cumulative 3 Gy dose (fractionated 8 x 0.375 Gy) of gamma radiation (Cs-137) or sham exposure starting on day 14. Elisa kit assessed serum catalase, clinical analyzer assessed serum Fe status and *ex vivo* pQCT scans measured bone parameters in the proximal/midshaft tibia and femoral neck. Mechanical strength was assessed by 3-pt bending and femoral neck test. There is a significant decrease in trabecular bone mineral density (BMD) from radiation (p<0.05) and a trend in diet (p=0.05) at the proximal tibia. There is a significant interaction in cortical BMD from the combined treatments at the midshaft tibia (p<0.05). There is a trending decrease in total BMD from diet (p=0.07) at the femoral neck. In addition, high serum Fe was correlated to low trabecular BMD (p<0.05) and high serum catalase was correlated to low BMD at all 3 bone sites (p<0.05). There was no difference in the max load of the tibia or femoral neck. Radiation and a high iron diet increases iron status and catalase in the serum and decreases BMD.

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